PCT/AU2005/000139
Stephan Heinz Josef Victor WEBER
Attorney Docket No. 02372.0097

ANNEXES TO THE

PRELIMINARY EXAMINATION REPORT

(ARTICLE 34 AMENDMENTS)

MAIL STOP PCT

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

REQUEST FOR SUBSTITUTION OF REPLACEMENT SHEETS

Please substitute the attached (2) replacement sheets, pages 4 and 6 of the specification, and the attached (7) replacement sheets, pages 16 through 22 of the claims, of the Article 34 Amendments, for pages 4 and 6 of the specification, and pages 16 through 22 of the claims, respectively, in the present application.

It is respectfully requested that the specification in the substitute sheets be examined during examination of the patent application. Do not examine claims 1-41 of the replacement sheets. A Preliminary Amendment is being filed concurrently herewith. New claims 43-83 are currently pending. Please examine new claims 43-83 as set forth in the Preliminary Amendment.

Respectfully submitted,

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Dated: August 2, 2006

By: _____
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EFC/FPD/blc
Enclosures

of the order of a year or more and then must be quickly relined in a short period of time as described in United States Patent 6565798 in the name of the applicant. This requires the installation of internal water cooling panels in an area to which there is limited access. Moreover, it is most desirable that damaged panels can be replaced without interfering with the integrity of the outer shell and its performance as a pressure vessel.

DISCLOSURE OF THE INVENTION

The present invention provides a metallurgical vessel comprising:

an outer shell; and

a plurality of cooling panels forming an interior lining for at least an upper part of the vessel, each panel having internal passages for flow of coolant there through;

wherein the outer shell is provided adjacent each cooling panel with a plurality of openings surrounded by tubular protrusions protruding outwardly from the shell and each panel is provided with a plurality of projections projecting laterally of the panel through said openings in the outer shell and connected to outer ends of the tubular protrusions in connections which attach the cooling panel to the outer shell and which seal the openings.

The cooling panels may be lined interiorly of the vessel with refractory material to form an interior refractory lining for the vessel, the cooling panels being operable by flow of coolant through said passages to cool the refractory material.

Said projections may be of elongate formation and may project laterally of the panel in mutually parallel relationship to one another.

In use of the vessel water may be passed through the internal passages of the panels to serve as the coolant.

The invention also provides a method of mounting a cooling panel on an outer shell of a metallurgical vessel so as to form part of an internal lining of that shell, comprising:

providing the cooling panel with a plurality of projections projecting laterally from the panel,

providing the outer shell of the vessel with a plurality of openings to receive the panel projections and with tubular protrusions surrounding the openings and protruding outwardly from the shell,

extending the projections through openings in the shell to bring the panel into a position in which it lines part of the interior of the shell, and

forming connections between the projections and outer ends of the tubular protrusions on the outside of the shell which connections mount the panel on the outer shell and seal the openings.

The invention further provides a cooling panel for mounting on an outer shell of a metallurgical vessel so as to form part of an internal lining of that shell, comprising:

a panel body having an internal passage means for flow of coolant therethrough, and

a plurality of projections projecting laterally of the panel to one side of the panel body and capable of supporting the panel when extended through openings in the shell and connected to the shell exteriorly of the vessel.

The panel body may comprise a coolant flow tube shaped to a zig-zag formation.

More specifically, the panel body may be formed of a single coolant tube shaped to form adjacent inner and outer panel sections of zig-zag formation and said projections may project laterally outwardly from the outer panel section.

CLAIMS:

1. A metallurgical vessel comprising:

an outer shell; and

a plurality of cooling panels forming an interior lining for at least an upper part of the vessel, each panel having internal passages for flow of coolant there through;

wherein the outer shell is provided adjacent each cooling panel with a plurality of openings surrounded by tubular protrusions protruding outwardly from the shell and each panel is provided with a plurality of projections projecting laterally of the panel through said openings in the outer shell and connected to outer ends of the tubular protrusions in connections which attach the cooling panel to the outer shell and which seal the openings.

2. A vessel as claimed in claim 1, wherein said projections and protrusions are rigid and said connections between them provide panel mountings to support the load of the panel.

3. A vessel as claimed in claim 2, wherein said connections comprise plate members having apertures locating the projections, the plate members being welded to the projections and to the outer ends of the protrusions to seal the openings.

4. A vessel as claimed in any one of the preceding claims, wherein the cooling panels are lined interiorly of the vessel with refractory material to form an interior refractory lining for the vessel, the cooling panels being operable by flow of coolant through said passages to cool the refractory material.

5. A vessel as claimed in any one of the preceding claims, wherein said projections are of elongate formation

and project laterally of the panel in mutually parallel relationship to one another.

6. A vessel as claimed in any one of the preceding claims, wherein said projections include a series of pins.

7. A vessel as claimed in claim 6, wherein said projections further comprise tubular coolant inlet and outlet connectors for the panel.

8. A vessel as claimed in any one of the preceding claims, wherein the vessel shell includes a generally cylindrical section lined with a series of said cooling panels.

9. A vessel as claimed in claim 8, wherein the panels of said series are of elongate arcuate formation with a curvature to match the curvature of the generally cylindrical section of the vessel.

10. A vessel as claimed in claim 9, wherein the panels of said series having greater length than height.

11. A vessel as claimed in claim 9 or 10, wherein the projections project laterally outwardly in parallel relationship with one another and so as to be parallel with a central plane extending laterally of the panel and radially of the panel curvature.

12. A vessel as claimed in any one of claims 8 to 11, wherein the panels of said series are disposed in vertically spaced tiers of panels spaced circumferentially of the vessel.

13. A vessel as claimed in claim 12, wherein the panels are closely spaced but with gaps between the

circumferentially spaced panels sufficient to permit removal of each panel by bodily movement thereof.

14. A vessel as claimed in claim 13, wherein there are at least six circumferentially spaced panels in each tier.

15. A vessel as claimed in any one of the preceding claims, wherein the panels are comprised of coolant flow tubes shaped to zigzag formations to form the panels.

16. A vessel as claimed in claim 15, wherein the projections are comprised of pins attached to the zigzag tube formations and tubular coolant and inlet and outlet connectors extending from ends of the zigzag tubular formations.

17. A vessel as claimed in claim 15 or claim 16, wherein at least a portion of the panels have inner and outer zigzag formations forming inner and outer panel sections relative to the vessel shell.

18. A vessel as claimed in claim 17, wherein the arcuate length of the outer panel section is less than the arcuate length of the inner panel section thereby allowing a gap between vertical edges of adjacent panels to be minimised.

19. A vessel as claimed in claim 17 or 18, wherein said inner panel section and said outer panel section are vertically off-set such that one or more horizontal pipe segments of one panel section are located intermediate horizontal pipe segments of the other panel section.

20. A vessel as claimed in any one of the preceding claims and further comprising a refractory lined hearth, a

barrel section disposed above the refractory lined hearth and an off-gas chamber disposed above the barrel section.

21. A vessel as claimed in claim 20, wherein a portion of the barrel section is lined with double layer panels and the off-gas chamber is lined with single layer panels.

22. A vessel as claimed in claim 21, wherein only a lowest row of panels in said barrel section comprise single layer panels.

23. A vessel as claimed in any one of the preceding claims, wherein said vessel locates a plurality of solids injection lances each extending through one of a plurality of apertures in the outer shell into an interior region of the vessel and said plurality of cooling panels providing a plurality of apertures corresponding to said apertures in the outer shell whereby said lances extend through said panels into said interior of said vessel.

24. A vessel as claimed in claim 23, wherein at least one said aperture is provided by a recess located on an edge of at least one panel.

25. A vessel as claimed in claim 24, wherein said at least one aperture is provided by alignment of at least two recesses located along edges or at corners of two or more panels.

26. A vessel as claimed in any one of claims 23 to 25, wherein the lances are located at a common height on the vessel shell at least some of the panels located at said height of said lances have a length corresponding substantially to the arcuate distance between the lances.

27. A cooling panel for mounting on an outer shell of a metallurgical vessel so as to form part of an internal lining of that shell, comprising:

a panel body having an internal passage means for flow of coolant therethrough, and

a plurality of projections projecting laterally of the panel to one side of the panel body and capable of supporting the panel when extended through openings in the shell and connected to the shell exteriorly of the vessel.

28. A cooling panel as claimed in claim 27, wherein the panel body comprises a coolant flow tube shaped to a zig-zag formation.

29. A cooling panel as claimed in claim 28, wherein the panel body is formed of a single coolant tube shaped to form adjacent inner and outer panel sections of zig-zag formation and said projections project laterally outwardly from the outer panel section.

30. A cooling panel as claimed in claim 29, wherein said inner panel section and said outer panel section are vertically off-set such that one or more horizontal pipe segments of one panel section are located intermediate horizontal pipe segments of the other panel section.

31. A cooling panel as claimed in claim 29 or claim 30 wherein the length of the outer panel section is less than the length of the inner panel section thereby in use allowing a gap between vertical edges of adjacent panels to be minimised.

32. A cooling panel as claimed in any one of claims 29 to 31, wherein the panel is of elongate arcuate formation and the outer panel section is disposed on the outer side of the panel curve with the projections projecting laterally outwardly in parallel relationship

with one another and so as to be parallel with a central plane extending laterally of the panel and radially of the panel curvature.

33. A cooling panel as claimed in any one of 29 to 32 wherein said panel is of elongate arcuate formation having greater length than height.

34. A cooling panel as claimed in any one of claims 29 to 33, wherein the projections comprise a series of pins and tubular coolant inlet and outlet connectors extending from ends of the coolant flow tube.

35. A cooling panel as claimed in claim 34, wherein the tubular coolant connectors are disposed at one end of the panel and the pins are spaced across the panel between its ends.

36. A cooling panel as claimed in claim 34 or claim 35, wherein the pins are connected to the panel by means of connector straps each fastened at its ends to adjacent tube segments of the inner panel section and extending between its ends outwardly across a tube segment of the outer panel section.

37. A cooling panel as claimed in claim 36, wherein the connector straps are generally V-shaped with the root of the V-shape curved to fit about the respective tube segment of the outer panel section.

38. A cooling panel as claimed in claim 36, wherein the pins are welded to the connector straps so as to extend outwardly from the roots of the V-shapes.

39. A method of mounting a cooling panel on an outer shell of a metallurgical vessel so as to form part of an internal lining of that shell, comprising:

providing the cooling panel with a plurality of projections projecting laterally from the panel,

providing the outer shell of the vessel with a plurality of openings to receive the panel projections and with tubular protrusions surrounding the openings and protruding outwardly from the shell,

extending the projections through openings in the shell to bring the panel into a position in which it lines part of the interior of the shell, and

forming connections between the projections and outer ends of the tubular protrusions on the outside of the shell which connections mount the panel on the outer shell and seal the openings.

40. A method as claimed in claim 39, wherein the shell is provided with tubular protrusions surrounding said openings and protruding outwardly from the shell and said connections are formed between the projections and the outer ends of the tubular protrusions.

41. A method as claimed in claim 39 or claim 40, wherein the cooling panel is as claimed in any one of claims 28 to 39.